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**Air-conditioning system and method for regulating the  
 heating capacity thereof**

10 The invention relates to an air-conditioning system, in  
 particular for a motor vehicle, according to the  
 preamble of claim 1 and to a method for regulating the  
 heating capacity thereof.

15 When an air-conditioning system is operating as a heat  
 pump, a specific heating capacity is available in order  
 to regulate the temperature of the air downstream of a  
 heater. In this case, the temperature of the heater can  
 be regulated by presetting a specific high pressure.  
 For reasons of stability and dynamics, cascaded heater  
 20 regulations, that is to say heater regulators with a  
 subordinate high-pressure regulator, are often used in  
 order to achieve the desired heating capacity.  
 Regulation of this type, however, still leaves much to  
 be desired.

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The object of the invention is to make an improved air-  
 conditioning system available.

30 This object is achieved by means of an air-conditioning  
 system having the features of claim 1. Advantageous  
 refinements are the subject matter of the subclaims.

35 According to the invention, an air-conditioning system,  
 in particular a motor vehicle air-conditioning system,  
 which can be operated as a heat pump, with a heater,  
 with a throttle member, with an evaporator and with a

compressor is provided, the compressor having a variable stroke and, as a result, heat-pump operation and, in particular, the temperature of the air downstream of the heater being regulatable. In this case, in particular the throttle member, which is designed as a regulatable expansion valve, contributes to regulating the heating capacity in heat-pump operation. By the heating capacity being regulated with the aid of an expansion valve and a variable compressive stroke, a markedly improved regulation of the heating capacity of an air-conditioning system in heat-pump operation is achieved.

The expansion valve preferably follows the heater and precedes the evaporator in the heat-pump circuit.

Regulation is carried out with the aid of a regulator for the stroke of the compressor. Preferably, a high-pressure regulator, in conjunction with a compressor valve, is provided for regulating the compressor and/or a high-pressure regulator is provided for regulating the expansion valve.

The expansion valve is preferably formed by an expansion valve regulated by means of a pulse-width modulated signal.

The regulation of the heating capacity of the air-conditioning system in heat-pump operation takes place preferably as a function of the desired temperature of the air downstream of the heater, taking into account a pilot control characteristic curve of a desired high-pressure value. In this case, the regulation of the heater temperature of the air-conditioning system in heat-pump operation takes place as a function of the desired temperature of the air downstream of the heater, taking into account the determined temperature of the air downstream of the heater, a correcting characteristic curve being taken into account.

Furthermore, preferably, the pressure of the refrigerant present in the heat-pump circuit, downstream of the compressor, is taken into account.

5 The invention is explained in detail below by means of an exemplary embodiment, with reference to the drawing. In the drawing, the single figure shows a block diagram which illustrates the regulation according to the invention.

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A heat-pump circuit 1 of the air-conditioning system is illustrated diagrammatically, in heat-pump operation, in the right lower part of the figure, a refrigerant contained in the heat-pump circuit 1 being compressed  
15 by a compressor 2 with a variable stroke, subsequently being supplied to a heater 3, in which it discharges heat into the vehicle interior, thereafter expanding in a throttle member 4, in the present case an expansion valve 5 regulated via a pulse-width modulated signal  
20 (PWM), then being supplied to an evaporator 6 in which it absorbs heat, and being supplied to the compressor 2 again.

The regulation of the heat-pump circuit 1 in order to  
25 achieve a predetermined desired temperature of the air downstream of the heater 3 takes place as illustrated in the figure.

In this case, the pressure in the heat-pump circuit 1  
30 is regulated as a function of a pilot control characteristic curve of the desired high-pressure value, taking into account the current pressure downstream of the compressor 2, measured by a pressure sensor, not illustrated, with the aid of a high-  
35 pressure regulator which regulates the stroke of the compressor 2 via a compressor valve (PWM compressor valve) regulated by means of a pulse-width modulated signal. Furthermore, a corresponding pulse-width modulated regulation of the expansion valve 5 (PWM

expansion valve) takes place via a high-pressure regulator of the expansion valve 5.

Furthermore, both in the regulation of the stroke of  
5 the compressor 2 and in the regulation of the expansion  
valve 5, the temperature of the heater 3 is taken into  
account by means of a heater temperature regulator,  
taking into account a correcting characteristic curve  
of the heater regulator, as a function of the  
10 temperature of the air downstream of the heater 3  
determined by means of a temperature sensor, not  
illustrated. The regulation of the temperature or  
capacity of the heater 3 thus takes place by means of  
the compressor 2 and the expansion valve 5.

**List of reference symbols**

- 1 Heat-pump circuit
- 2 Compressor
- 3 Heater
- 4 Throttle member
- 5 Expansion valve
- 6 Evaporator